WHAT IS CLAIMED IS:

1. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit; and

a motion vector detector for detecting a motion vector by using the data outputted from the first storage unit and the data outputted from the second storage unit;

wherein said second address generator performs subsampling on the addresses of the data to be outputted from the first storage unit and the second storage unit so that the addresses are sampled in a checker pattern with respect to pixel arrays corresponding to images of the reference block and the target block.

2. A motion vector detection apparatus as defined in Claim 1, wherein:

said second address generator comprises;

a row counter for counting pixel addresses in the horizontal direction,

a column counter for counting pixel addresses in the vertical direction, and

an address holder for holding addresses of pixel data; and

an inverted value of LSB (least significant bit) of the count value outputted from the column counter is added to each address of pixel data, thereby performing the checker-pattern subsampling with respect to the pixel arrays corresponding to the images of the reference block and the target block.

3. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit; and

a motion vector detector for detecting a motion vector by using the data outputted from the first storage unit and the data outputted from the second storage unit;

wherein said motion vector detector subtracts the absolute values of differences in pixel data between the reference block and the target block, one by one, from a threshold value, and when the result of subtraction becomes negative, the motion vector detector stops calculation of the sum of absolute differences in the corresponding position.

4. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit;

a motion vector detector for detecting a motion vector by using the data outputted from the first storage unit and the data outputted from the second storage unit; and

a search history holder for holding history of search for reference blocks in the reference area which has already been searched;

wherein execution of search is skipped with respect to every reference block whose search history has been stored in the search history holder.

5. A motion vector detection apparatus as defined in Claim 4, wherein said search history holder holds, as search history, the position of a target of search, and information as to whether reference blocks in eight positions on the periphery of the target have been searched or not.

6. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a

predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit;

a motion vector detector for detecting a motion vector by using the data outputted from the first storage unit and the data outputted from the second storage unit;

a transfer rule holder for holding transfer rules by which the first address generator generates addresses of reference area data to be outputted to the first storage unit; and

a transfer rule detector for detecting a transfer rule from the transfer rule holder on the basis of an area decision code indicating an effective area of image data, and outputting the transfer rule to the first address generator;

wherein said first address generator generates addresses of reference area data to be outputted to the first storage unit, on the basis of the transfer rule outputted from the transfer rule detector.

7. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit having a double buffer structure to perform data read-in and data read-out simultaneously, and holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit;

a motion vector detector for detecting a motion vector by using the data outputted from the first storage unit and the data outputted from the second storage unit; and

a stored data controller for controlling read-in and read-out of the reference area data into/from the first storage unit;

wherein said first storage unit possesses two buffer memories, and said stored data controller copies effective data from one of

the buffer memories in which data read-out has completed, into the other buffer memory in which data read-in is carried out, thereby reducing the amount of data to be written in the first storage unit.

8. A motion vector detection apparatus as defined in any of Claims 1 to 7, wherein said motion vector detector is an integer precision motion vector detector that detects an integer precision motion vector from the data outputted from the first storage unit and the data outputted from the second storage unit.

9. A motion vector detection apparatus as defined in any of Claims 1 to 7, wherein said motion vector detector comprises:

an interpolation pixel generator for receiving the data outputted from the first storage unit, and generating decimal precision pixel data; and

a decimal precision motion vector detector for detecting a decimal precision motion vector from the data outputted from the interpolation pixel generator and the data outputted from the second storage unit.

10. A motion vector detection apparatus as defined in any of Claims 1 to 7, wherein said motion vector detector comprises:

an integer precision motion vector detector that detects an integer precision motion vector from the data outputted from the

first storage unit and the data outputted from the second storage unit;

an interpolation pixel generator for receiving the data outputted from the first storage unit, and generating decimal precision pixel data; and

a decimal precision motion vector detector for detecting a decimal precision motion vector from the data outputted from the interpolation pixel generator and the data outputted from the second storage unit.

11. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit;

an interpolation pixel generator for receiving the data outputted from the first storage unit, and generating decimal precision pixel data;

a decimal precision motion vector detector for detecting a decimal precision motion vector from the data outputted from the interpolation pixel generator and the data outputted from the second storage unit; and

a reading direction decision unit for deciding the reading direction of the reference area data stored in the first storage unit, and outputting the reading direction to the second address generator;

wherein said second address generator generates addresses of pixel data to be outputted from the first storage unit, on the basis of the reading direction decided by the reading direction decision unit.

12. A motion vector detection apparatus as defined in Claim 11, wherein said reading direction decision unit decides that data should be read in the horizontal direction or the vertical direction with respect to the image data stored in the first storage unit.

13. A motion vector detection apparatus as defined in Claim 11 or 12, wherein said interpolation pixel generator comprises:

a shift register unit comprising at least two shift

registers; and

an interpolation unit performing interpolation using pixel data stored in the shift register unit.

14. A motion vector detection apparatus as defined in Claim 11 or 12, wherein said interpolation pixel generator comprises:

a shift register unit comprising, at least, (the number of pixels to be read out in a specific direction + 2) pieces of shift registers; and

an interpolation unit performing interpolation using pixel data stored in the shift register unit.

15. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data

to be outputted from the first storage unit and the second storage unit;

an interpolation pixel generator for receiving the data outputted from the first storage unit, and generating decimal precision pixel data;

a decimal precision motion vector detector for detecting a decimal precision motion vector from the data outputted from the interpolation pixel generator and the data outputted from the second storage unit;

wherein said decimal precision motion vector detector pertorms parallel detection of decimal precision motion vectors on two decimal precision reference blocks which are composed of plural pixel data outputted from the interpolation pixel generator and are positioned, with respect to a reference block in the center, above and beneath, on the left and on the right, diagonally to the upper right and diagonally to the lower right, diagonally to upper left and diagonally to the lower left, diagonally to the upper right and diagonally to the upper left, or diagonally to the lower right and diagonally to the lower left.

16. A motion vector detection apparatus as defined in any of Claims 11 to 15 further comprising an integer precision motion vector detector for detecting an integer precision motion vector from the data outputted from the first storage unit and the data outputted from the second storage unit.

17. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit;

an integer precision motion vector detector for detecting an integer precision motion vector from the data outputted from the first storage unit and the data outputted from the second storage unit;

a search propriety condition holder for holding search propriety conditions for judging whether search can be carried out in the corresponding positions or not; and

a search propriety condition detector for detecting a search propriety condition from the search propriety condition holder,

on the basis of an area decision code indicating an effective area in the reference area, and outputting the condition to the second address generator;

wherein said second address generator generates addresses of data to be outputted from the first storage unit, using the search propriety condition detected by the search propriety condition detector.

18. A motion vector detection apparatus as defined in Claim 17 further comprising:

an interpolation pixel generator for receiving the data outputted from the first storage means, and generating decimal precision pixel data; and

a decimal precision motion vector detector for detecting a decimal precision motion vector from the data outputted from the interpolation pixel generator and the data outputted from the second storage means;

wherein said second address generator uses the search propriety condition holder and the search propriety condition detector when detecting the integer precision motion vector, and when detecting the decimal precision motion vector.

19. A motion vector detection apparatus as defined in Claim 17 further comprising:

an interpolation pixel generator for receiving the data

outputted from the first storage means, and generating decimal precision pixel data; and

a decimal precision motion vector detector for detecting a decimal precision motion vector from the data outputted from the interpolation pixel generator and the data outputted from the second storage means;

wherein said second address generator judges the propriety of search by using the search propriety condition holder and the search propriety condition detector when detecting the integer precision motion vector, and judges, by using the result of the judgement, the propriety of search when detecting the decimal precision motion vector.

20. A motion vector detection apparatus for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said apparatus comprising:

a first address generator for generating addresses of data in the target block and addresses of data in the reference area;

a first storage unit for holding data of the reference area designated by the first address generator;

a second storage unit for holding data of the target block designated by the first address generator;

a second address generator for generating addresses of data to be outputted from the first storage unit and the second storage unit;

an integer precision motion vector detector for detecting an integer precision motion vector from the data outputted from the first storage unit and the data outputted from the second storage unit; and

a search execution propriety decision unit for holding a motion vector that has been detected by the previous search, and compares the absolute difference values calculated by the integer precision motion vector detector with a predetermined threshold value to decide whether motion vector search should be executed or not;

wherein said second address generator generates addresses of data to be outputted from the first storage unit and the second storage unit, by using the motion vector that has been detected by the previous search and stored in the search execution propriety decision unit.

21. A motion vector detection apparatus as defined in Claim 20, wherein said second address generator outputs the data outputted from the first storage means, as the result of calculation of this apparatus.

22. A motion vector detection apparatus as defined in Claim 20

or 21 further comprising:

an interpolation pixel generator for receiving the data outputted from the first storage unit, and generating decimal precision pixel data; and

a decimal precision motion vector detector for detecting a decimal precision motion vector from the data outputted from the interpolation pixel generator and the data outputted from the second storage unit.

23. A motion vector detection method for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data; and

a motion vector detection step of detecting a motion vector by using the reference area data and the target block data;

wherein said second address generation step performs subsampling on the addresses of the data to be outputted from the first storage unit and the second storage unit so that the addresses are sampled in a checker pattern with respect to pixel arrays corresponding to images of the reference block and the target block.

24. A motion vector detection method as defined in Claim 23, wherein:

said second address generation step comprises;

a first counting step of counting pixel addresses in the horizontal direction,

a second counting step of counting pixel addresses in the vertical direction, and

an address holding step of holding addresses of pixel data; and

an inverted value of LSB (least significant bit) of the count value in the second counting step is added to each address of pixel data, thereby performing the checker-pattern subsampling with respect to the pixel arrays corresponding to the images of the reference block and the target block.

25. A motion vector detection method for detecting a motion

vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data; and

a motion vector detection step of detecting a motion vector by using the reference area data and the target block data;

wherein said motion vector detection step subtracts the absolute values of differences in pixel data between the reference block and the target block, one by one, from a threshold value, and when the result of subtraction becomes negative, the motion vector detection step stops calculation of the sum of absolute differences in the corresponding position.

26. A motion vector detection method for detecting a motion

vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data;

a motion vector detection step of detecting a motion vector by using the reference area data and the target block data; and

a search history holding step of holding history of search for reference blocks in the reference area which has already been searched;

wherein execution of search is skipped with respect to every reference block whose search history has been stored in the search history holding step.

27. A motion vector detection method as defined in Claim 26,

wherein said search history holding step holds, as search history, the position of a target of search, and information as to whether reference blocks in eight positions on the periphery of the target have been searched or not.

28. A motion vector detection method for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data;

a motion vector detection step of detecting a motion vector by using the reference area data and the target block data;

a transfer rule holding step of holding transfer rules by which the first address generation step generates addresses of

the reference area data; and

a transfer rule detection step of detecting a transfer rule from the transfer rule holding step on the basis of an area decision code indicating an effective area of image data, and outputting the transfer rule to the first address generation step;

wherein said first address generation step generates addresses of the reference area data, on the basis of the transfer rule detected in the transfer rule detection step.

29. A motion vector detection method for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step, using a memory having a double buffer structure to perform data read-in and data read-out simultaneously;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data;

a motion vector detection step of detecting a motion vector by using the reference area data and the target block data; and

a stored data control step of controlling read-in and read-out of the reference area data into/from the first storage step;

wherein said first storage step uses two buffer memories, and said stored data control step copies effective data from one of the buffer memories in which data read-out has completed, into the other buffer memory in which data read-in is carried out, thereby reducing the amount of data to be written in the first storage step.

30. A motion vector detection method as defined in any of Claims 23 to 29, wherein said motion vector detection step is an integer precision motion vector detection step of detecting an integer precision motion vector by using the reference area data and the target block data.

31. A motion vector detection method as defined in any of Claims 23 to 29, wherein said motion vector detection step comprises:

an interpolation pixel generation step of receiving the pixel data constituting the reference area data, and generating decimal precision pixel data; and

a decimal precision motion vector detection step of detecting a decimal precision motion vector, using the data outputted from the interpolation pixel generation step, and the target block data.

32. A motion vector detection method as defined in any of Claims 23 to 29, wherein said motion vector detection step comprises:

an integer precision motion vector detection step of detecting an integer precision motion vector, using the reference area data and the target block data;

an interpolation pixel generation step of receiving the pixel data constituting the reference area data, and generating decimal precision pixel data; and

a decimal precision motion vector detection step of detecting a decimal precision motion vector, using the data outputted from the interpolation pixel generation step, and the target block data.

33. A motion vector detection method for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of

data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data;

an interpolation pixel generation step of receiving the pixel data constituting the reference area data, and generating decimal precision pixel data;

a decimal precision motion vector detection step of detecting a decimal precision motion vector, using the data outputted from the interpolation pixel generation step, and the target block data; and

a reading direction decision step of deciding the reading direction of the reference area data stored in the first storage step, and outputting the reading direction to the second address generation step;

wherein said second address generation step generates addresses of pixel data to be outputted from the reference area data, on the basis of the reading direction decided in the reading direction decision step.

34. A motion vector detection method as defined in Claim 33, wherein said reading direction decision step decides that data should be read in the horizontal direction or the vertical direction with respect to the image data stored in the first storage step.

35. A motion vector detection method for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data;

an interpolation pixel generation step of receiving the pixel data constituting the reference area data, and generating decimal precision pixel data;

a decimal precision motion vector detection step of detecting a decimal precision motion vector, using the data outputted from the interpolation pixel generation step, and the target block data;

wherein said decimal precision motion vector detection step performs parallel detection of decimal precision motion vectors on two decimal precision reference blocks which are composed of plural pixel data outputted from the interpolation pixel generation step and are positioned, with respect to a reference block in the center, above and beneath, on the left and on the right, diagonally to the upper right and diagonally to the lower right, diagonally to upper left and diagonally to the lower left, diagonally to the upper right and diagonally to the upper left, or diagonally to the lower right and diagonally to the lower left.

36. A motion vector detection method as defined in any of Claims 33 to 35 further comprising an integer precision motion vector detection step of detecting an integer precision motion vector, using the reference area data and the target block data.

37. A motion vector detection method for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to

the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data;

an integer precision motion vector detection step of detecting an integer precision motion vector, using the reference area data and the target block data;

a search propriety condition holding step of holding search propriety conditions for judging whether search can be carried out in the corresponding positions or not; and

a search propriety condition detection step of detecting a search propriety condition from the search propriety condition holding step, on the basis of an area decision code indicating an effective area in the reference area, and outputting the condition to the second address generation step;

wherein said second address generation step generates addresses of data to be outputted from the first storage unit, using the search propriety condition detected in the search

propriety condition detection step.

38. A motion vector detection method as defined in Claim 37 further comprising:

an interpolation pixel generation step of receiving the pixel data constituting the reference area data, and generating decimal precision pixel data; and

a decimal precision motion vector detection step of detecting a decimal precision motion vector, using the data outputted from the interpolation pixel generation step, and the target block data;

wherein said second address generation step uses the search propriety condition holding step and the search propriety condition detection step when detecting the integer precision motion vector, and when detecting the decimal precision motion vector.

39. A motion vector detection method as defined in Claim 37 further comprising:

an interpolation pixel generation step of receiving the pixel data constituting the reference area data, and generating decimal precision pixel data; and

a decimal precision motion vector detection step of detecting a decimal precision motion vector, using the data outputted from the interpolation pixel generation step, and the target block

data;

wherein said second address generation step judges the propriety of search by using the search propriety condition holding step and the search propriety condition detection step when detecting the integer precision motion vector, and judges, by using the result of the judgement, the propriety of search when detecting the decimal precision motion vector.

40. A motion vector detection method for detecting a motion vector by performing block matching between a target block comprising a plurality of pixels in a current image, and a reference block comprising a plurality of pixels in a predetermined reference area in a past image that is previous to the current image, said method comprising:

a first address generation step of generating addresses of data in the target block and addresses of data in the reference area;

a first storage step of holding data of the reference area designated by the first address generation step;

a second storage step of holding data of the target block designated by the first address generation step;

a second address generation step of generating addresses of pixel data to be outputted from the stored reference area data and target block data;

an integer precision motion vector detection step of

detecting an integer precision motion vector, using the reference area data and the target block data; and

a search execution propriety decision step of holding a motion vector that has been detected by the previous search, and compares the absolute difference values calculated by the integer precision motion vector detector with a predetermined threshold value to decide whether motion vector search should be executed or not;

wherein said second address generation step generates addresses of pixel data to be outputted from the reference area data and the target block data, using the motion vector that has been detected by the previous search and stored in the search execution propriety decision step.

41. A motion vector detection method as defined in Claim 40, wherein said second address generation step outputs, as the result of calculation, the data outputted from the reference area data stored in the first storage step.

42. A motion vector detection method as defined in Claim 40 or 41 further comprising:

an interpolation pixel generation step of receiving the pixel data constituting the reference area data, and generating decimal precision pixel data; and

a decimal precision motion vector detection step of detecting

a decimal precision motion vector, using thc data outputted from the interpolation pixel generation step, and the target block data.